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(54) **ENERGY CONSCIOUS MOBILE DEVICE REDUNDANCY AND RECOVERY**

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H04W 4/22	(2009.01)

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CPC *G06F 11/142* (2013.01); *H04W 4/22* (2013.01); *G06F 2201/85* (2013.01); *G06F 2201/86* (2013.01)

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See application file for complete search history.

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(57) **ABSTRACT**

A tool for redundancy and recovery for a mobile device. The tool probes for one or more available resources on the mobile device, wherein probing for the one or more available resources includes gathering diagnostic information related to the one or more available resources. The tool determines a device functionality for the mobile device, wherein the device functionality is an energy conscious recovery plan including one or more features available on the mobile device. The tool scavenges for at least one resource to support the device functionality for the mobile device. The tool restores the device functionality for the mobile device, wherein restoring the device functionality includes utilizing the at least one resource and one or more energy conscious techniques.

10 Claims, 3 Drawing Sheets

MOBILE DEVICE 102
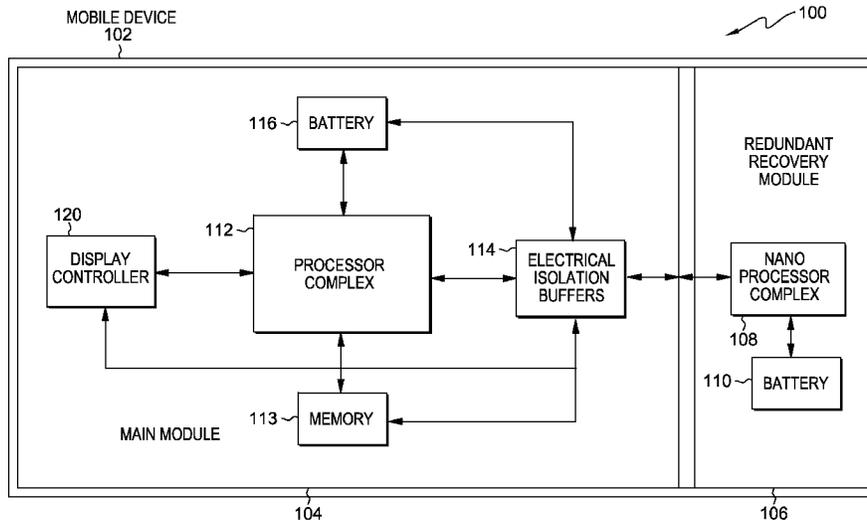
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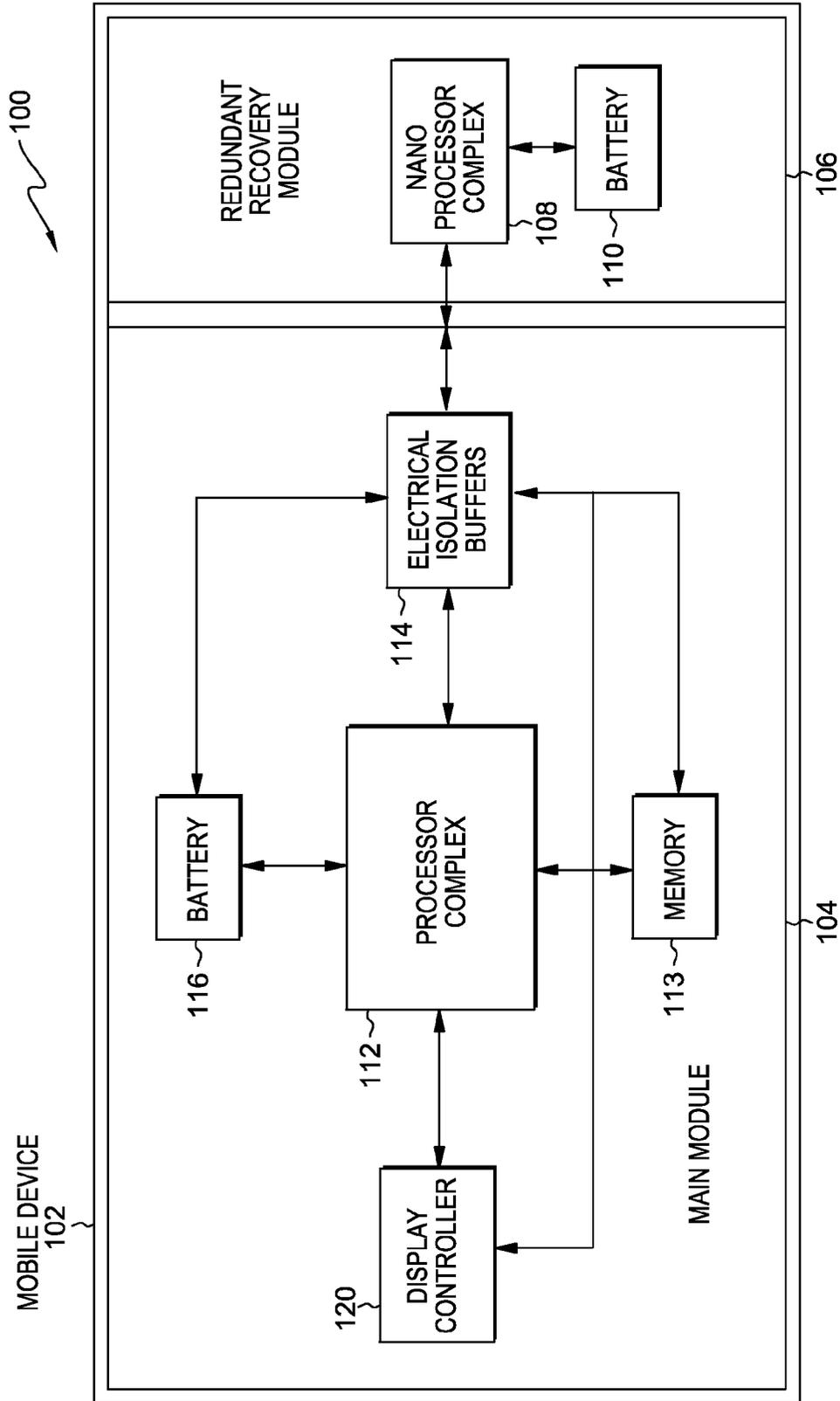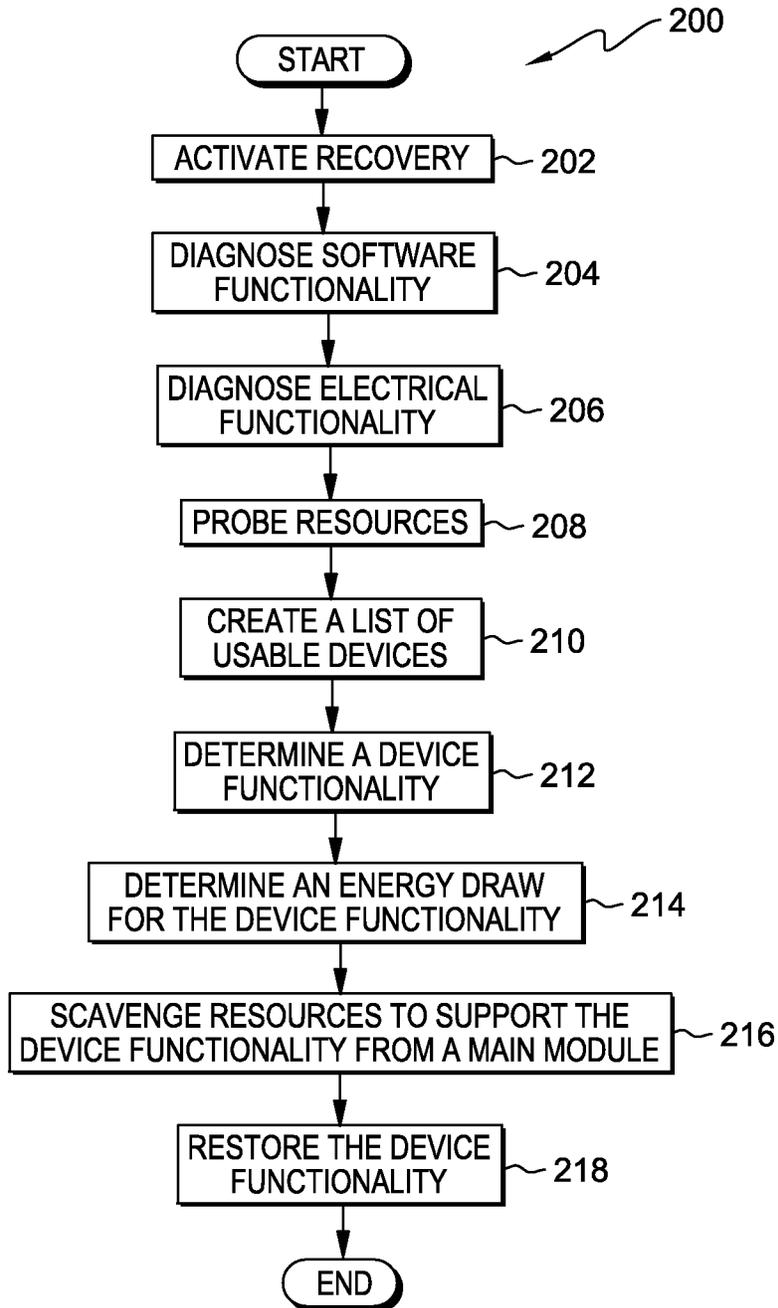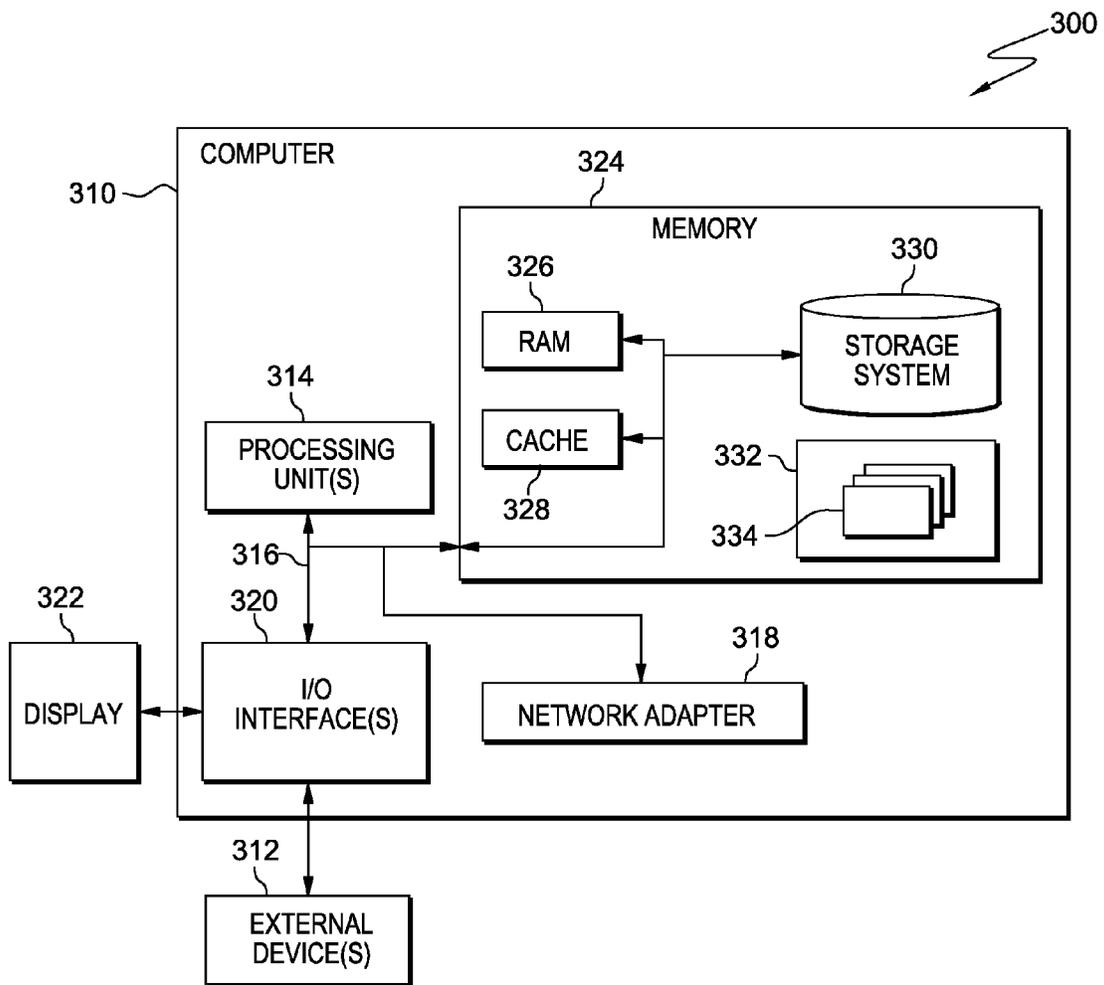
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FIG. 1

200

START

ACTIVATE RECOVERY ⟋ 202

DIAGNOSE SOFTWARE
FUNCTIONALITY ⟋ 204

DIAGNOSE ELECTRICAL
FUNCTIONALITY ⟋ 206

PROBE RESOURCES ⟋ 208

CREATE A LIST OF
USABLE DEVICES ⟋ 210

DETERMINE A DEVICE
FUNCTIONALITY ⟋ 212

DETERMINE AN ENERGY DRAW
FOR THE DEVICE FUNCTIONALITY ⟋ 214

SCAVENGE RESOURCES TO SUPPORT THE
DEVICE FUNCTIONALITY FROM A MAIN MODULE ⟋ 216

RESTORE THE DEVICE
FUNCTIONALITY ⟋ 218

END

FIG. 2

300

COMPUTER

310

324

MEMORY

326

RAM

330

STORAGE SYSTEM

314

PROCESSING UNIT(S)

CACHE

328

332

334

316

322

320

DISPLAY

I/O INTERFACE(S)

318

NETWORK ADAPTER

312

EXTERNAL DEVICE(S)

FIG. 3

ENERGY CONSCIOUS MOBILE DEVICE REDUNDANCY AND RECOVERY

BACKGROUND OF THE INVENTION

The present invention relates generally to telecommunications, and more particularly to energy conscious redundancy and disaster recovery techniques for mobile devices.

Mobile devices are capable of performing a diverse set of functions and providing a wide range of behaviors for various purposes, however, these functions can become compromised when the operating system (OS) of the mobile device locks up due to, for example, a malicious application installed on the mobile device, a software failure, or a hardware failure, etc. Users of mobile devices are presented with limited remedies in failure situations, and as such, there is potential for a loss of information stored on the mobile device. Additionally, having the mobile device become unavailable at an inopportune time, such as during an emergency, can cause other serious problems.

SUMMARY

Aspects of an embodiment of the present invention disclose a method, system, and computer program product for redundancy and recovery for a mobile device. The method includes probing, by one or more computer processors, for one or more available resources on the mobile device, wherein probing for the one or more available resources includes gathering diagnostic information related to the one or more available resources. The method includes determining, by one or more computer processors, a device functionality for the mobile device, wherein the device functionality is an energy conscious recovery plan including one or more features available on the mobile device. The method includes scavenging, by one or more computer processors, for at least one resource to support the device functionality for the mobile device. The method includes restoring, by one or more computer processors, the device functionality for the mobile device, wherein restoring the device functionality includes utilizing the at least one resource and one or more energy conscious techniques.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 illustrates a functional block diagram illustrating a data processing environment, generally designated 100, in accordance with an embodiment of the present invention.

FIG. 2 depicts a flowchart of the operational steps of a redundant recovery module, generally designated 200, for energy conscious redundancy and recovery for a mobile device, in accordance with an embodiment of the present invention.

FIG. 3 illustrates a block diagram depicting components of a data processing system (such as the main module of FIG. 1), generally designated 300, in accordance with an embodiment of the present invention.

DETAILED DESCRIPTION

Implementation of such embodiments may take a variety of forms, and exemplary implementation details are discussed subsequently with reference to the Figures.

The present invention will now be described in detail with reference to the Figures. FIG. 1 is a functional block diagram illustrating a data processing environment, generally designated 100, in accordance with an embodiment of the present

invention. FIG. 1 provides only an illustration of one implementation and does not imply any limitations with regard to the environments in which different embodiments may be implemented. Many modifications to the depicted environment may be made by those skilled in the art without departing from the scope of the invention as recited by the claims. Data processing environment 100 includes a mobile device 102.

In the exemplary embodiment, mobile device 102 may be, for example, a desktop computer, a laptop computer, a tablet computer, a personal digital assistant (PDA), a smart phone, a thin client, or any other electronic device or computing system capable of receiving, processing, storing, and sending data. In one embodiment, mobile device 102 may be any suitable type of mobile device capable of running mobile applications, including a smart phone, tablet, slate, or any type of device that runs a mobile operating system. Mobile device 102 includes a main module 104 and a redundant recovery module (RRM) 106.

In an alternate embodiment, mobile device 102 may be any wearable electronic device, including wearable electronic devices affixed to eyeglasses and sunglasses, helmets, wristwatches, clothing, wigs, and the like, capable of receiving, processing, storing, and sending data.

In the exemplary embodiment, main module 104 is a conventional mobile device module providing device functionality, such as sending, receiving, and processing data, through the use of one or more integrated devices, including, but not limited to, processor complex 112, battery 116, memory 113, and display controller 120. In the exemplary embodiment, processor complex 112 is a conventional processor including electronic circuitry that carries out instructions provided by an operating system, a program, or a mobile application. In one embodiment, processor complex 112 fetches instructions from memory 113 to decode and execute the instructions. In the exemplary embodiment, battery 116 is a conventional portable rechargeable battery useful in mobile device applications, for example, lithium-ion and nickel-cadmium, nickel-zinc, and nickel metal hydride. In the exemplary embodiment, memory 113 is a conventional memory device for storing instructions, programs, and data on a temporary or permanent basis. In the exemplary embodiment, display controller 120 is a conventional device used to control a display (not shown) on a mobile device, such as mobile device 102.

In the exemplary embodiment, RRM 106 is a combination of software and firmware integrated with a mobile device, such as mobile device 102, for providing energy conscious redundancy and disaster recovery for the mobile device. In the exemplary embodiment, RRM 106 resides in a dedicated physical core (i.e., separate from a main module of the mobile device, such as main module 104 of mobile device 102), and is isolated from the main module by electrical isolation buffers, such as electrical isolation buffers 114 in main module 104 of mobile device 102. In one embodiment, RRM 106 can be isolated from environmental hazards through the use of specific packaging, for example, thermal isolation, waterproofing, and shock proofing to ensure RRM 106 remains available to provide redundancy and recovery to the mobile device. In the exemplary embodiment, RRM 106 diagnoses problems on the main module using conventional reliability, availability, and serviceability (RAS) techniques. In the exemplary embodiment, RRM 106 maintains dual ported access to a memory in the main module of the mobile device, such as memory 113 in main module 104 of mobile device 102, to facilitate diagnosis. In the exemplary embodiment, RRM 106 can be activated (i.e., enabled) by a

physical reset switch located on mobile device **102** (not shown). In another embodiment, RRM **106** may be activated automatically when a failure event, for example, a software failure, an electrical failure, an operating system hang up, or an environmental hazard is detected.

In the exemplary embodiment, RRM **106** restores functionality on the main module in an energy conscious manner, such that redundancy and recovery is engaged proportionally to a residual energy (i.e., battery charge). In the exemplary embodiment, RRM **106** determines device functionality for the mobile device post failure, and an energy draw necessary to provide the device functionality. RRM **106** compares the energy draw to a residual charge available, and prioritizes device functionality to be restored in an energy conscious manner, such that, for example, emergency phone services, GPS tracking beacons, and pinging, etc. are the first device functionalities gradually restored.

RRM **106** includes nanoprocessor complex **108** for providing surrogacy functionality for a processor complex on the main module, such as processor complex **112** of main module **104**, in the event of a catastrophic failure of the processor complex. In the exemplary embodiment, nanoprocessor complex **108** is interconnected with one or more devices in main module **104** through a hardwired shadow plane. In the exemplary embodiment, the hardwired shadow plane is a circuit layer allowing RRM **106** to probe, monitor, and determine the health of every module on a main processor complex, such as main module **104**. In some embodiments, the hardwired shadow plane may provide the capability to send signals to trigger or switch main processor complex modules to various states. In the exemplary embodiment, nanoprocessor complex **108** provides the capability to utilize the one or more devices in main module **104**, such as processor complex **112**, battery **116**, memory **113**, and display controller **120** to restore functionality in an energy conscious manner.

RRM **106** includes battery **110** for providing backup power for redundancy and recovery functionality. In the exemplary embodiment, battery **110** can be any conventional mobile device battery, for example, a rechargeable lithium ion battery. In some embodiments, battery **110** may be a solar powered battery, or any other energy conscious, self-restoring battery. In one embodiment, RRM **106** can use battery **110** to power redundancy and recovery functionality, including diagnostics, surrogacy, probing, and restoring device functionality. In the exemplary embodiment, in an effort to provide energy conscious redundancy and recovery, RRM **106** scavenges resources on the main module of the mobile device to draw charge from one or more devices, such as battery **116**, to provide power for redundancy and recovery functionality, prior to operating on backup power provided by battery **110**.

FIG. **2** depicts a flowchart of the operational steps of a redundant recovery module, such as RRM **106**, generally designated **200**, for energy conscious redundancy and recovery for a mobile device, in accordance with an embodiment of the present invention.

RRM **106** activates recovery (**202**). In the exemplary embodiment, RRM **106** activates recovery functionality in response to enablement of a phone reset switch on a mobile device (i.e., a phone reset switch being turned on by a user of the mobile device). For example, a user of a mobile device, such as mobile device **102**, may begin experiencing an operating system (OS) hang up condition (e.g., a boot up malfunction) while trying to power up the mobile device. The user, in response to unsuccessfully being able to power up the mobile device, may turn on the phone reset switch of

the mobile device, notifying RRM **106** to activate recovery functionality. In some other embodiments, RRM **106** may activate recovery functionality in response to a trigger condition, such as a change in an environmental condition (e.g., a change in temperature above or below a threshold temperature), or an emergency activation (e.g., a heavy shock or impact to a mobile device). For example, if a user of a mobile device is in an automobile accident, RRM **106** may activate recovery functionality in response to an impact associated with the accident.

RRM **106** diagnoses software functionality (**204**). In the exemplary embodiment, RRM **106** diagnoses software functionality by searching one or more devices on the mobile device for malfunctions. In the exemplary embodiment, RRM **106** searches one or more devices on the mobile device, including, without limitation, one or more registers in a processor complex, such as processor complex **112**, a non-volatile memory, one or more traces of a last invocation, and a plurality of software traces and dumps. In the exemplary embodiment, RRM **106** searches for malfunctions by probing the one or more devices via a hardwired shadow plane, wherein the probing utilizes energy conscious RAS techniques. In some embodiments, RRM **106** employs a probing timeout, such that RRM **106** probes for malfunctions in software functionality proportional to a charge remaining on a battery of the mobile device, such as battery **116** of mobile device **102**. For example, RRM **106** may perform a cursory diagnosis of malfunctions where a residual charge on a battery of the mobile device is low, and alternatively, perform a thorough diagnosis of malfunctions where the residual change on a battery of the mobile device is high.

RRM **106** diagnoses electrical functionality (**206**). In the exemplary embodiment RRM **106** diagnoses electrical functionality by searching one or more devices on the mobile device for malfunctions. In the exemplary embodiment, RRM **106** searches one or more devices on the mobile device, including, without limitation, one or more registers in a processor complex, such as processor complex **112**, a battery, such as battery **116**, memory, such as memory **113**, and a display controller, such as display controller **120**. In the exemplary embodiment, RRM **106** searches for electrical malfunctions, such as overheating, electrical shorts, etc., by probing the one or more devices via a hardwired shadow plane and diagnostic wiring, wherein the probing utilizes energy conscious RAS techniques. In some embodiments, RRM **106** employs a probing timeout, such that RRM **106** probes for malfunctions in electrical functionality proportional to a charge remaining on a battery of the mobile device, such as battery **116** of mobile device **102**. For example, RRM **106** may perform a cursory diagnosis of malfunctions where a residual charge on a battery of the mobile device is low, and alternatively, perform a thorough diagnosis of malfunctions where the residual change on a battery of the mobile device is high.

RRM **106** probes resources (**208**). In the exemplary embodiment, RRM **106** probes resources available on a mobile device, such as mobile device **102**, gathering diagnostic information related to one or more available resources, such as battery **116** and processor complex **112**, for determining a state of the entire system, determining resources available for scavenging, and a total energy available to power redundancy and recovery functionality, etc.

RRM **106** creates a list of usable devices (**210**). In the exemplary embodiment, RRM **106** creates a list of usable devices (i.e., components) of a mobile device based, at least in part, on a diagnosis of software functionality, a diagnosis

of electrical functionality, and a probing of resources available on the mobile device, such as mobile device **102**. RRM **106** creates a list of usable components by inventorying one or more components, and, from these inventoried components, excludes those components experiencing malfunctions.

RRM **106** determines a device functionality (**212**). In the exemplary embodiment, RRM **106** determines a device functionality for a mobile device, such as mobile device **102**, wherein the device functionality is a recovery plan for restoring one or more features of the mobile device, such as making an emergency phone call, activating a global positioning system, connecting to a wireless network, and broadcasting a beacon, etc., that are made available to a user of the mobile device by one or more usable devices from the list of usable devices. In some embodiments, RRM **106** determines a device functionality based, at least in part, on energy conscious techniques. For example, RRM **106** may configure a device functionality that restores only an emergency phone call option and a broadcast beacon option, based, at least in part, on a predicted low energy draw for the restored features. In another example, where a display on a mobile device is malfunctioning or damaged, rendering it unusable, RRM **106** may determine a device functionality that enables voice commands in order to initiate an emergency call.

RRM **106** determines an energy draw for the device functionality (**214**). In the exemplary embodiment, RRM **106** determines an energy draw for the device functionality, wherein the energy draw is a predictive value of how much energy is required to restore the one or more features available in the device functionality. For example, RRM **106** may determine an energy draw required to restore the one or more features available in the device functionality, such as an emergency phone call, enable a GPS location, and connect to a wireless network, as low to moderate.

RRM **106** scavenges resources to support the device functionality from a main module (**216**). In the exemplary embodiment, RRM **106** scavenges resources from a main module of a mobile device, such as main module **104** of mobile device **102** to provide sufficient charge (i.e., energy) to satisfy an energy draw required to restore one or more features available in the device functionality. For example, where an energy draw required to restore one or more features available in the device functionality is low to moderate, RRM **106** may scavenge resources, such as siphon charge from a battery, a processor complex, or a wiring harness on the main module of the mobile device, to accumulate sufficient energy to restore and power one or more features available in the device functionality.

RRM **106** restores the device functionality (**218**). In the exemplary embodiment, responsive to scavenging resources to provide sufficient charge to satisfy an energy draw required to restore and power one or more features, RRM **106** restores the device functionality in an energy conscious manner by bringing up the system gradually, based, at least in part, on remaining battery power, expected battery life, scavenged resources, and any external conditions affecting energy consumption (e.g., extreme cold), etc.

FIG. **3** is a block diagram, generally designated **300**, depicting components of a data processing system (such as mobile device **106** of data processing environment **100**), in accordance with an embodiment of the present invention. It should be appreciated that FIG. **3** provides only an illustration of one implementation and does not imply any limitations with regard to the environments in that different embodiments can be implemented. Many modifications to the depicted environment can be made.

In the illustrative embodiment, mobile device **106** in data processing environment **100** is shown in the form of a general-purpose computing device. The components of computer system **310** can include, but are not limited to, one or more processors or processing unit **314**, memory **324**, and bus **316** that couples various system components including memory **324** to processing unit(s) **314**.

Bus **316** represents one or more of any of several types of bus structures, including a memory bus or memory controller, a peripheral bus, an accelerated graphics port, and a processor or local bus using any of a variety of bus architectures. By way of example, and not limitation, such architectures include Industry Standard Architecture (ISA) bus, Micro Channel Architecture (MCA) bus, Enhanced ISA (EISA) bus, Video Electronics Standards Association (VESA) local bus, and Peripheral Component Interconnect (PCI) bus.

Computer system **310** typically includes a variety of computer system readable media. Such media can be any available media that is accessible by computer system **310**, and it includes both volatile and non-volatile media, removable and non-removable media.

Memory **324** can include computer system readable media in the form of volatile memory, such as random access memory (RAM) **326** and/or cache memory **328**. Computer system **310** can further include other removable/non-removable, volatile/non-volatile computer system storage media. By way of example only, storage system **330** can be provided for reading from and writing to a non-removable, non-volatile magnetic media (not shown and typically called a "hard drive"). Although not shown, a magnetic disk drive for reading from and writing to a removable, non-volatile magnetic disk (e.g., a "floppy disk"), and an optical disk drive for reading from or writing to a removable, non-volatile optical disk such as a CD-ROM, DVD-ROM, or other optical media can be provided. In such instances, each can be connected to bus **316** by one or more data media interfaces. As will be further depicted and described below, memory **324** can include at least one computer program product having a set (e.g., at least one) of program modules that are configured to carry out the functions of embodiments of the invention.

Program/utility **332**, having one or more sets of program modules **334**, can be stored in memory **324** by way of example, and not limitation, as well as an operating system, one or more application programs, other program modules, and program data. Each of the operating systems, one or more application programs, other program modules, and program data, or some combination thereof, can include an implementation of a networking environment. Program modules **334** generally carry out the functions and/or methodologies of embodiments of the invention as described herein. Computer system **310** can also communicate with one or more external devices **312** such as a keyboard, a pointing device, a display **322**, etc., or one or more devices that enable a user to interact with computer system **310** and any devices (e.g., network card, modem, etc.) that enable computer system **310** to communicate with one or more other computing devices. Such communication can occur via Input/Output (I/O) interface(s) **320**. Still yet, computer system **310** can communicate with one or more networks such as a local area network (LAN), a general wide area network (WAN), and/or a public network (e.g., the Internet) via network adapter **318**. As depicted, network adapter **318** communicates with the other components of computer system **310** via bus **316**. It should be understood that although not shown, other hardware and software components, such

as microcode, device drivers, redundant processing units, external disk drive arrays, RAID systems, tape drives, and data archival storage systems can be used in conjunction with computer system **310**.

The present invention may be a system, a method, and/or a computer program product. The computer program product may include a computer readable storage medium (or media) having computer readable program instructions thereon for causing a processor to carry out aspects of the present invention.

The computer readable storage medium can be any tangible device that can retain and store instructions for use by an instruction execution device. The computer readable storage medium can be, for example, but is not limited to, an electronic storage device, a magnetic storage device, an optical storage device, an electromagnetic storage device, a semiconductor storage device, or any suitable combination of the foregoing. A non-exhaustive list of more specific examples of the computer readable storage medium includes the following: a portable computer diskette, a hard disk, a random access memory (RAM), a read-only memory (ROM), an erasable programmable read-only memory (EPROM or Flash memory), a static random access memory (SRAM), a portable compact disc read-only memory (CD-ROM), a digital versatile disk (DVD), a memory stick, a floppy disk, a mechanically encoded device such as punch-cards or raised structures in a groove having instructions recorded thereon, and any suitable combination of the foregoing. A computer readable storage medium, as used herein, is not to be construed as being transitory signals per se, such as radio waves or other freely propagating electromagnetic waves, electromagnetic waves propagating through a wave-guide or other transmission media (e.g., light pulses passing through a fiber-optic cable), or electrical signals transmitted through a wire.

Computer readable program instructions described herein can be downloaded to respective computing/processing devices from a computer readable storage medium or to an external computer or external storage device via a network, for example, the Internet, a local area network, a wide area network and/or a wireless network. The network can comprise copper transmission cables, optical transmission fibers, wireless transmission, routers, firewalls, switches, gateway computers and/or edge servers. A network adapter card or network interface in each computing/processing device receives computer readable program instructions from the network and forwards the computer readable program instructions for storage in a computer readable storage medium within the respective computing/processing device.

Computer readable program instructions for carrying out operations of the present invention can be assembler instructions, instruction-set-architecture (ISA) instructions, machine instructions, machine dependent instructions, microcode, firmware instructions, state-setting data, or either source code or object code written in any combination of one or more programming languages, including an object oriented programming language such as Smalltalk, C++ or the like, and conventional procedural programming languages, such as the "C" programming language or similar programming languages. The computer readable program instructions can execute entirely on the user's computer, partly on the user's computer, as a stand-alone software package, partly on the user's computer and partly on a remote computer or entirely on the remote computer or server. In the latter scenario, the remote computer can be connected to the user's computer through any type of network, including a local area network (LAN) or a wide

area network (WAN), or the connection can be made to an external computer (for example, through the Internet using an Internet Service Provider). In some embodiments, electronic circuitry including, for example, programmable logic circuitry, field-programmable gate arrays (FPGA), or programmable logic arrays (PLA) can execute the computer readable program instructions by utilizing state information of the computer readable program instructions to personalize the electronic circuitry, in order to perform aspects of the present invention.

Aspects of the present invention are described herein with reference to flowchart illustrations and/or block diagrams of methods, apparatus (systems), and computer program products according to embodiments of the invention. It will be understood that each block of the flowchart illustrations and/or block diagrams, and combinations of blocks in the flowchart illustrations and/or block diagrams, can be implemented by computer readable program instructions.

These computer readable program instructions can be provided to a processor of a general purpose computer, a special purpose computer, or other programmable data processing apparatus to produce a machine, such that the instructions, which execute via the processor of the computer or other programmable data processing apparatus, create means for implementing the functions/acts specified in the flowchart and/or block diagram block or blocks. These computer readable program instructions can also be stored in a computer readable storage medium that can direct a computer, a programmable data processing apparatus, and/or other devices to function in a particular manner, such that the computer readable storage medium having instructions stored therein comprises an article of manufacture including instructions which implement aspects of the function/act specified in the flowchart and/or block diagram block or blocks.

The computer readable program instructions can also be loaded onto a computer, other programmable data processing apparatus, or other device to cause a series of operational steps to be performed on the computer, other programmable apparatus or other device to produce a computer implemented process, such that the instructions which execute on the computer, other programmable apparatus, or other device implement the functions/acts specified in the flowchart and/or block diagram block or blocks.

The flowchart and block diagrams in the Figures illustrate the architecture, functionality, and operation of possible implementations of systems, methods, and computer program products according to various embodiments of the present invention. In this regard, each block in the flowchart or block diagrams can represent a module, segment, or portion of instructions, which comprises one or more executable instructions for implementing the specified logical function(s). In some alternative implementations, the functions noted in the block can occur out of the order noted in the Figures. For example, two blocks shown in succession can, in fact, be executed substantially concurrently, or the blocks can sometimes be executed in the reverse order, depending upon the functionality involved. It will also be noted that each block of the block diagrams and/or flowchart illustration, and combinations of blocks in the block diagrams and/or flowchart illustration, can be implemented by special purpose hardware-based systems that perform the specified functions or acts or carry out combinations of special purpose hardware and computer instructions.

The descriptions of the various embodiments of the present invention have been presented for purposes of illustration, but are not intended to be exhaustive or limited

to the embodiments disclosed. Many modifications and variations will be apparent to those of ordinary skill in the art without departing from the scope and spirit of the invention. The terminology used herein was chosen to best explain the principles of the embodiment, the practical application or technical improvement over technologies found in the marketplace, or to enable others of ordinary skill in the art to understand the embodiments disclosed herein.

The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the invention. It should be appreciated that any particular nomenclature herein is used merely for convenience and thus, the invention should not be limited to use solely in any specific function identified and/or implied by such nomenclature. Furthermore, as used herein, the singular forms of "a", "an", and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise.

What is claimed is:

1. A computer program product for redundancy and recovery for a mobile device, the computer program product comprising:

one or more computer readable storage media and program instructions stored on the one or more computer readable storage media, the program instructions comprising:

responsive to the mobile device unsuccessfully powering up, program instructions to activate, by one or more computer processors, a recovery functionality via a physical reset switch on the mobile device;

program instructions to probe, by one or more computer processors, for one or more available resources on the mobile device, wherein probing for the one or more available resources includes gathering diagnostic information related to the one or more available resources;

program instructions to determine, by one or more computer processors, a device functionality for the mobile device, wherein the device functionality is an energy conscious recovery plan including one or more features available on the mobile device;

program instructions to scavenge, by one or more computer processors, for at least one resource to support the device functionality for the mobile device, wherein scavenging includes siphoning charge from a battery, a processor complex, or a wiring harness within a main module of the mobile device to accumulate sufficient energy to restore and power the one or more features available on the mobile device; and

program instructions to restore, by one or more computer processors, the device functionality for the mobile device, wherein restoring the device functionality includes utilizing the at least one resource and one or more energy conscious techniques.

2. The computer program product of claim 1, wherein program instructions to probe for one or more available resources on the mobile device, further comprise:

program instructions to diagnose, by one or more computer processors, a software functionality for the mobile device, wherein diagnosing the software functionality includes utilizing one or more energy conscious reliability, availability, and serviceability (RAS) techniques; and

program instructions to diagnose, by one or more computer processors, an electrical functionality for the

mobile device, wherein diagnosing the electrical functionality includes utilizing one or more energy conscious RAS techniques.

3. The computer program product of claim 1 further comprises:

program instructions to search, by one or more computer processors, for one or more malfunctions in one or more devices via a hardwired shadow plane, wherein searching includes utilizing one or more energy conscious RAS techniques.

4. The computer program product of claim 1, wherein program instructions to determine a device functionality for the mobile device, further comprise:

program instructions to create, by one or more computer processors, a list of usable components based, at least in part, on one or more of:

a diagnosis of software functionality;

a diagnosis of electrical functionality; and

a probing of resources available on a mobile device.

5. The computer program product of claim 1, wherein program instructions to scavenge for at least one resource to support the device functionality for the mobile device, further comprise:

program instructions to determine, by one or more computer processors, an energy draw for the device functionality, wherein the energy draw is a predictive value of how much energy is required to restore the at least one feature available in the device functionality.

6. The computer program product of claim 5, wherein program instructions to determine an energy draw for the device functionality, further comprise:

program instructions to inventory, by one or more computer processors, one or more components of the mobile device; and

program instructions to exclude, by one or more computer processors, the one or more components of the mobile device experiencing a malfunction.

7. The computer program product of claim 1, wherein program instructions to determine a device functionality for the mobile device, further comprise:

program instructions to determine, by one or more computer processors, one or more features to include in the device functionality based, at least in part, on one or more energy conscious techniques, the one or more features including one or more of:

an emergency phone call;

a global positioning system; and

a beacon broadcast.

8. A computer system for redundancy and recovery for a mobile device,

the computer system comprising:

a memory; and

one or more computer processors in communications with the memory, wherein the computer system is configured to perform a method comprising:

responsive to the mobile device unsuccessfully powering up, program instructions to activate, by one or more computer processors, a recovery functionality via a physical reset switch on the mobile device;

program instructions to probe, by one or more computer processors, for one or more available resources on the mobile device, wherein probing for the one or more available resources includes gathering diagnostic information related to the one or more available resources;

program instructions to determine, by one or more computer processors, a device functionality for the mobile device, wherein the device functionality is an energy conscious recovery plan including one or more features available on the mobile device;

program instructions to scavenge, by one or more computer processors, for at least one resource to support the device functionality for the mobile device, wherein scavenging includes siphoning charge from a battery, a processor complex, or a wiring harness within a main module of the mobile device to accumulate sufficient energy to restore and power the one or more features available on the mobile device; and

program instructions to restore, by one or more computer processors, the device functionality for the mobile device, wherein restoring the device functionality includes utilizing the at least one resource and one or more energy conscious techniques.

9. The computer system of claim 8, wherein probing for one or more available resources on the mobile device, further comprises:

diagnosing, by one or more computer processors, a software functionality for the mobile device, wherein diagnosing the software functionality includes utilizing one or more energy conscious reliability, availability, and serviceability (RAS) techniques; and

diagnosing, by one or more computer processors, an electrical functionality for the mobile device, wherein diagnosing the electrical functionality includes utilizing one or more energy conscious RAS techniques.

10. The computer system of claim 8, further comprises:

searching, by one or more computer processors, for one or more malfunctions in one or more devices via a hard-wired shadow plane, wherein searching includes utilizing one or more energy conscious RAS techniques.

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